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None

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(54) Welding components in pants-type garments

(57) Pants-type garments are formed from an outer water-impermeable backsheet (3), an absorbent core (4) and a permeable topsheet (2) doubled over a crotch line (13) and welded along intermittent weld lines (14). The welds are effected by a horn (42) cooperating with anvils (44, 44') on a drum (43), the anvils comprising projections spaced along the drum (43).

FIG.1

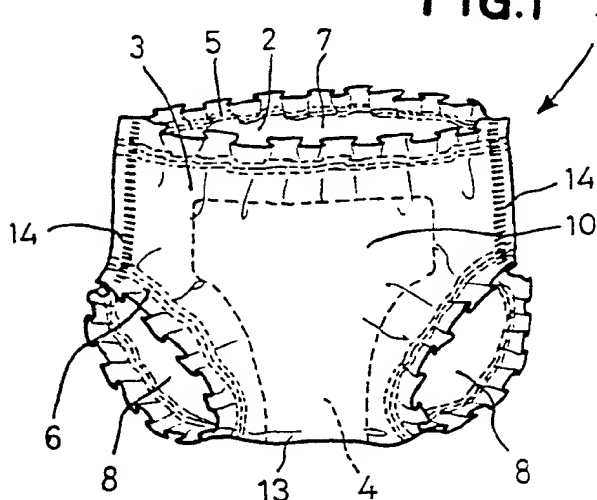
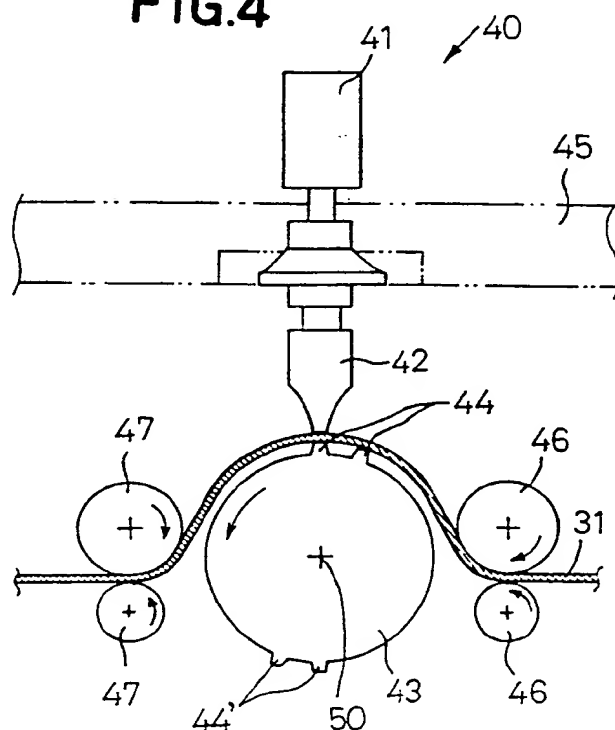


FIG.4



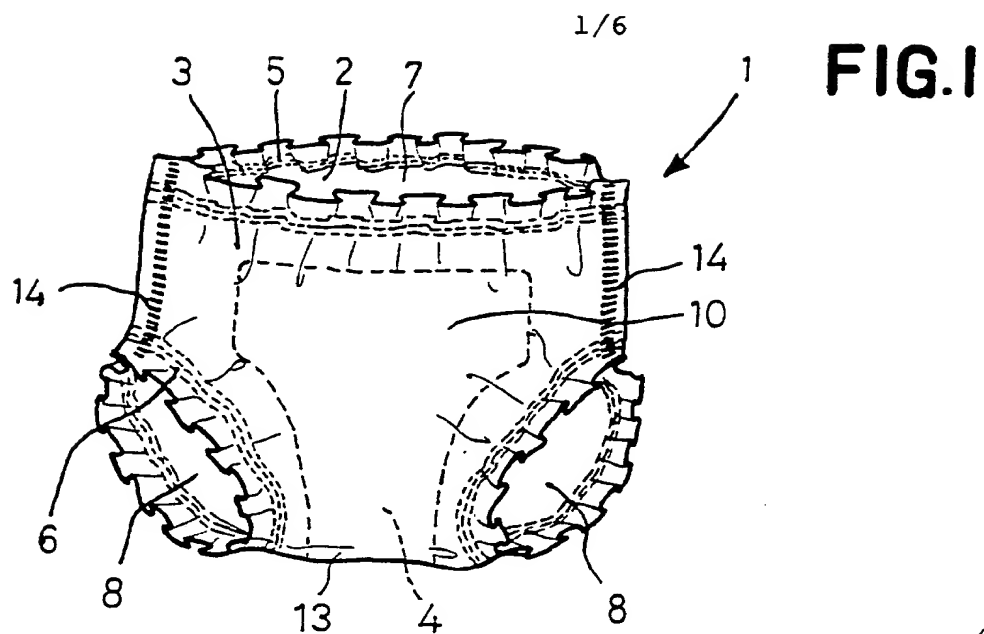


FIG.2

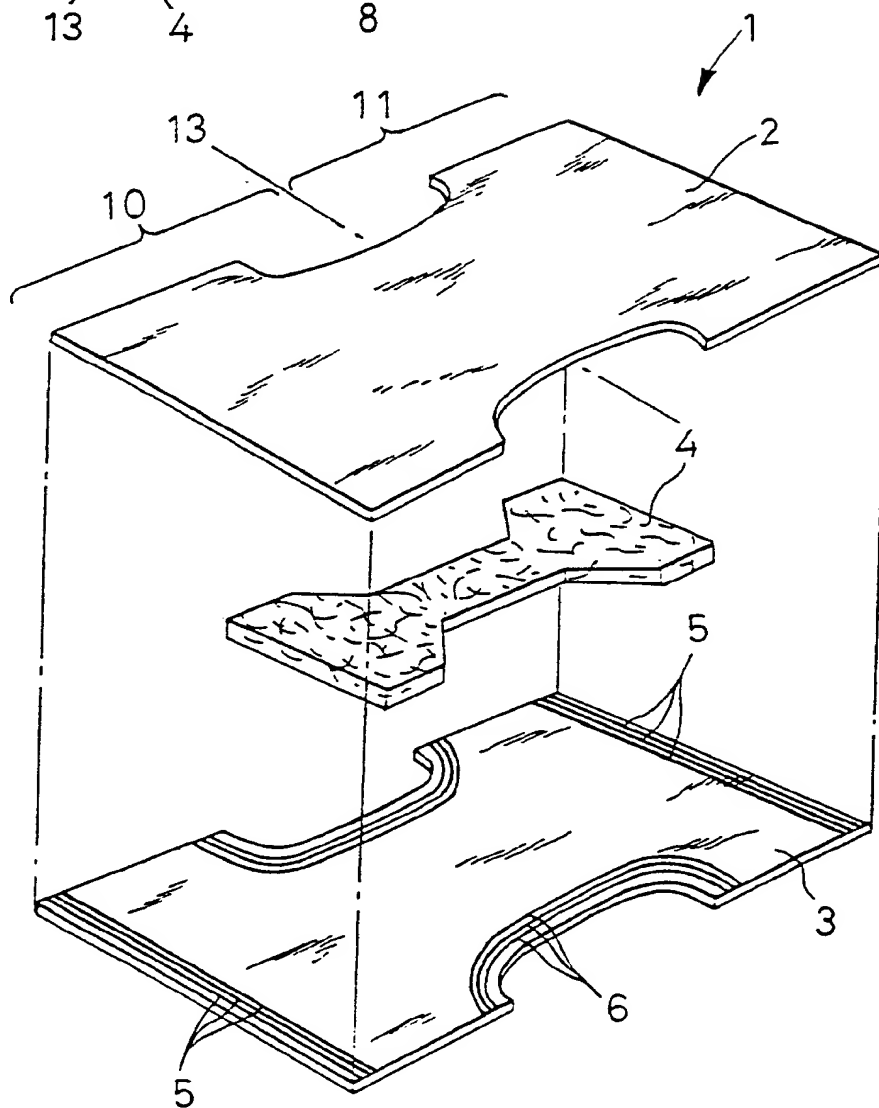


FIG.3

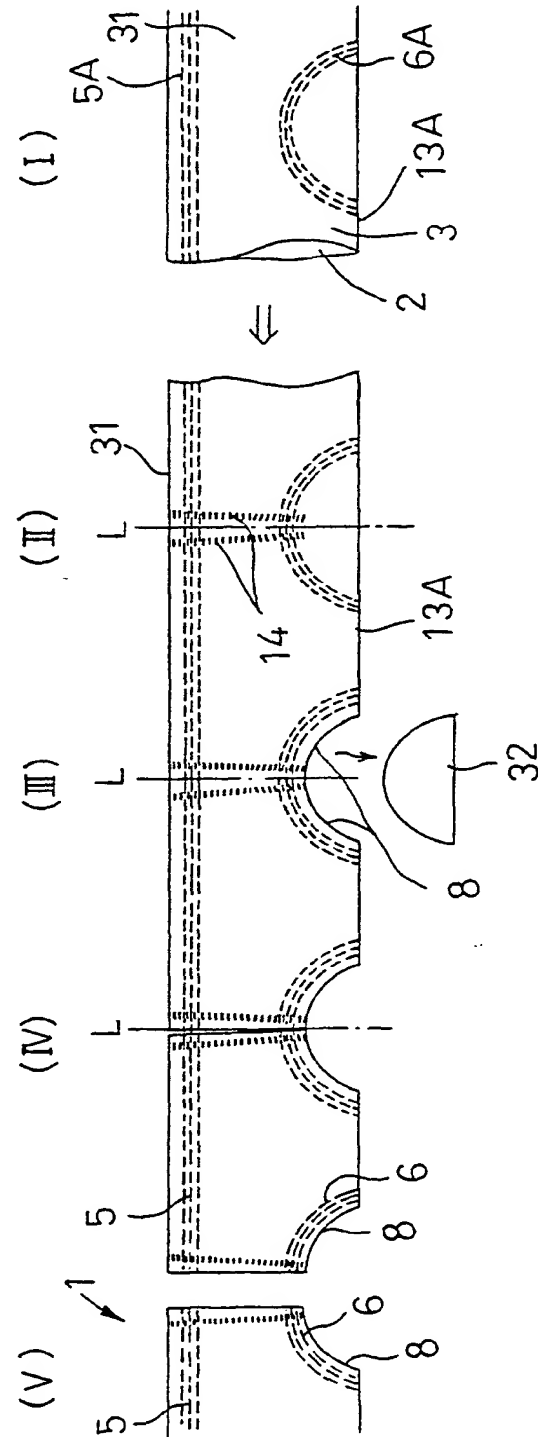


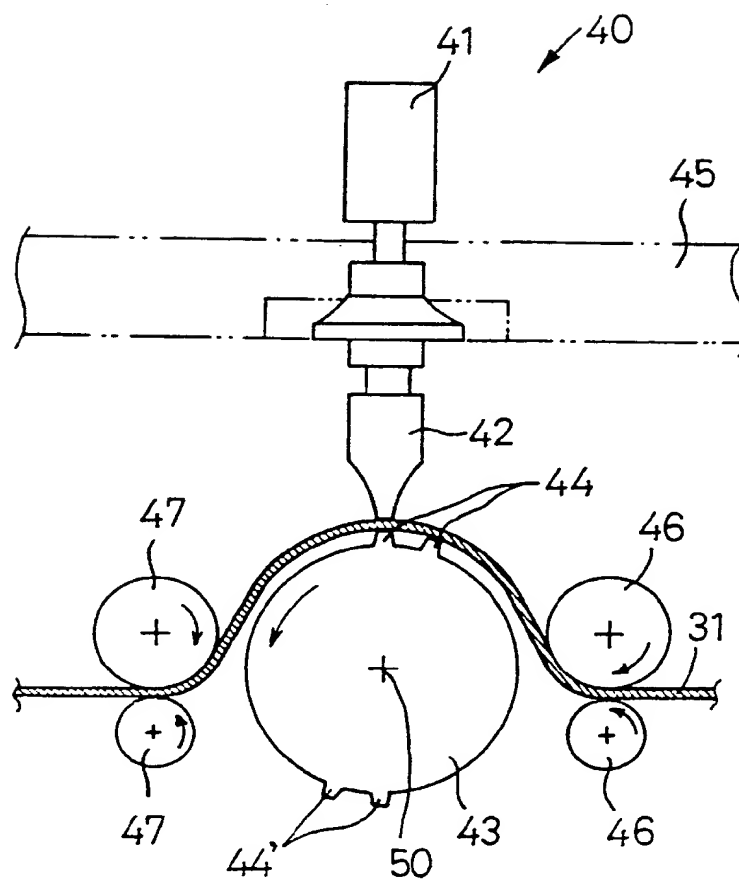
FIG.4

FIG.5

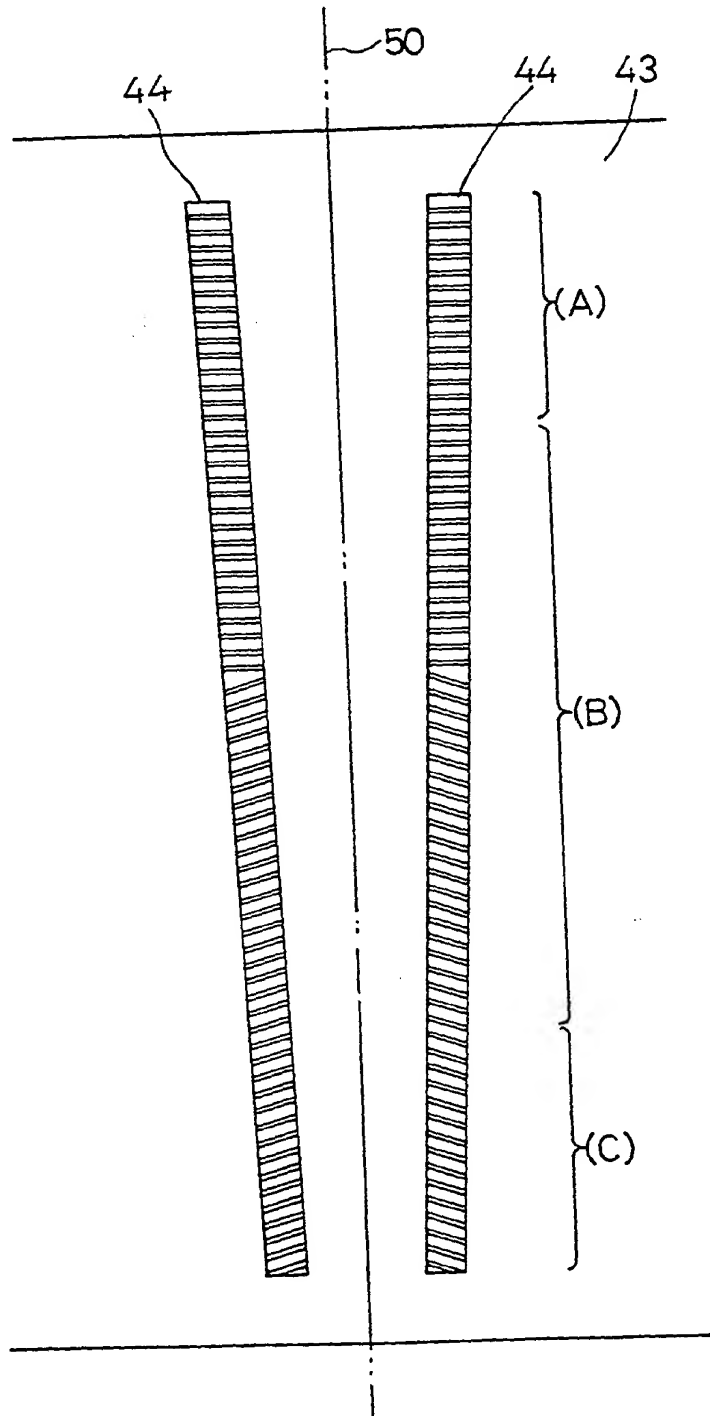


FIG.6A

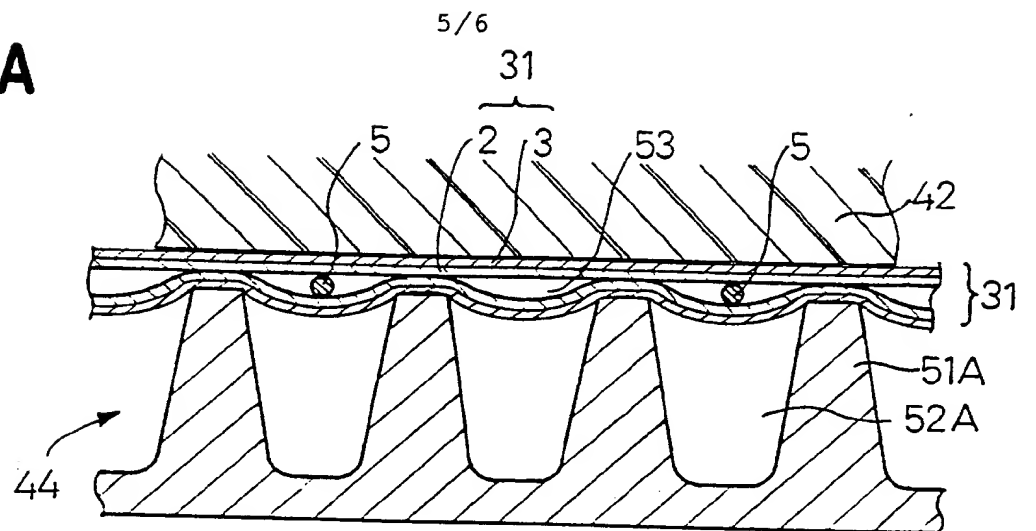


FIG.6B

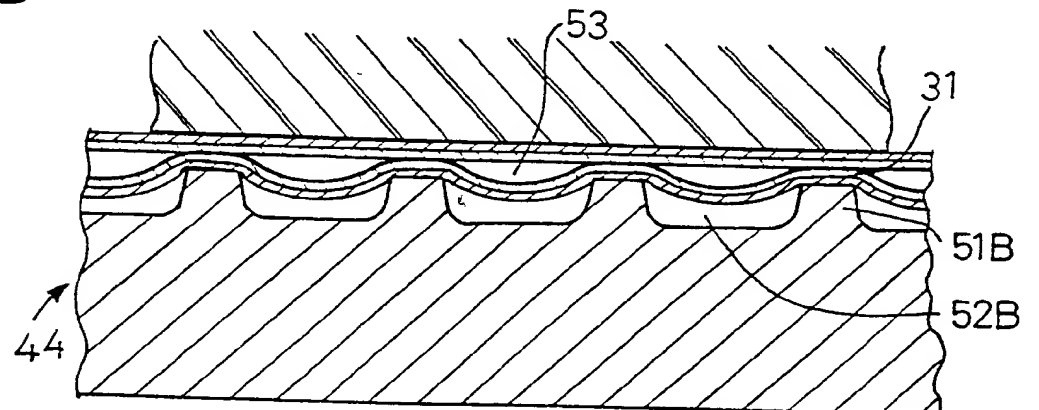


FIG.6C

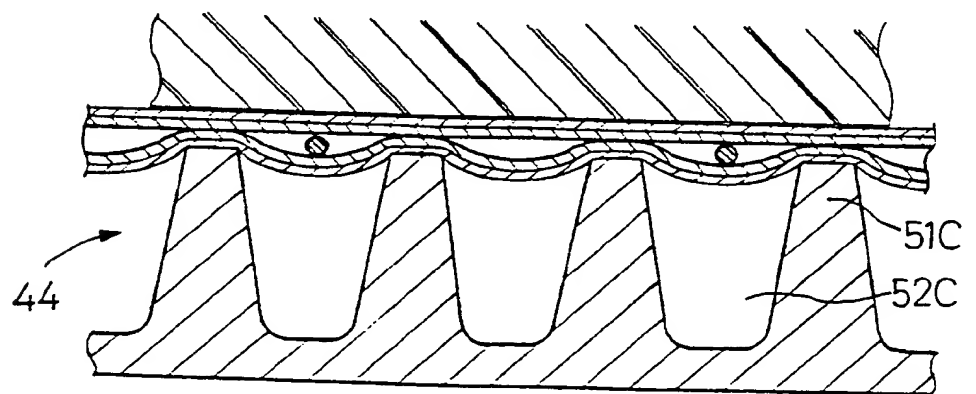


FIG.7A

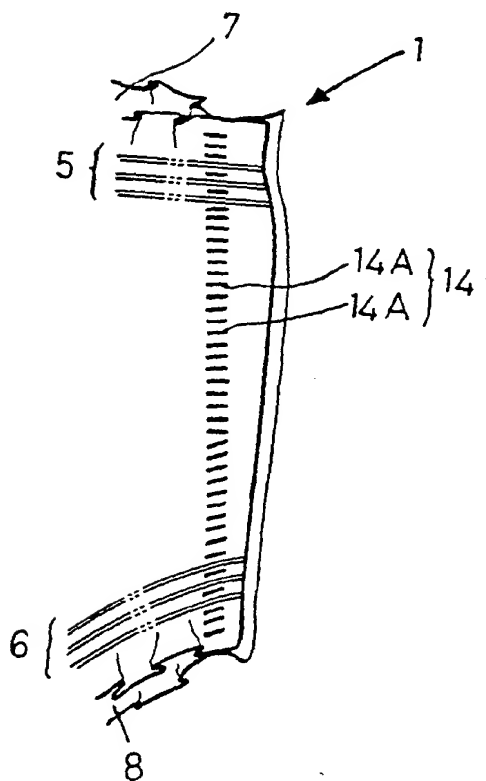
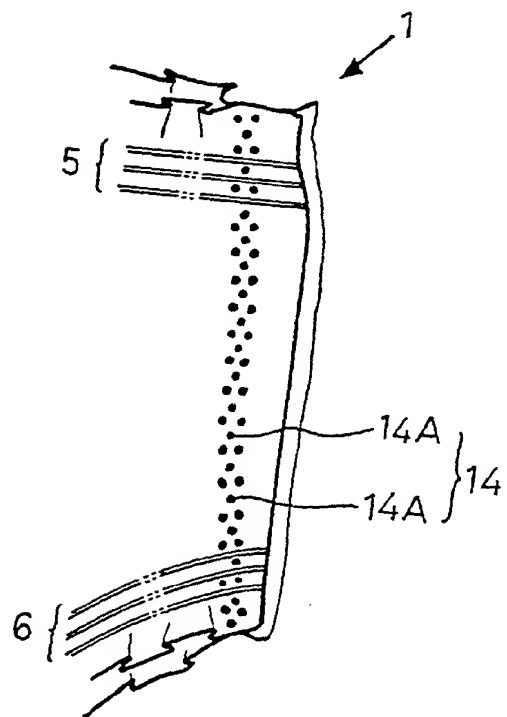


FIG.7B



-1-

METHOD AND APPARATUS FOR ATTACHING OF COMPONENTS
IN PANTS-TYPE GARMENTS

This invention relates to method and apparatus for attaching laterally opposite waist sides of pants-type disposable garments such as disposable diaper, training pants or the like.

In manufacturing the pants-type garments, it has usually been a practice that respective sheet members forming front and rear bodies are laid one on another and then attached together along laterally opposite waist sides. For example, a single sheet member common to the front and rear bodies may be folded in two along a crotch line and attached together along the laterally opposite waist sides to provide a basic configuration of the pants. Such attaching is often achieved by a single or a plurality of continuous attaching line or lines of hot melt type adhesive, suture or the like.

The pants-type garment obtained in this manner certainly provides good fitness and effectively prevents excretion from leaking. However, such an article of prior art has relatively poor air-permeability and readily causes stuffiness. Additionally, this article is disadvantageous in that, when it has received body fluid or excretion,

wearer's legs are apt to be smudged with such body fluid or excretion as the garment is stripped down along the legs. These disadvantages may be overcome by intermittently attaching the laterally opposite waist sides of the pants-type garment. Specifically, the front and rear bodies of this garment may be laid one on another and then intermittently attached to each other along said opposite waist sides to provide an air-permeable gap between these front and rear bodies. In addition, the laterally opposite waist sides can be easily torn open along the attached waist sides and thereby the garment can be stripped off from the wearer without smudging the legs.

While it is easy in a continuous manufacturing process for the pants-type garment to achieve the intermittent attaching along the laterally opposite waist side with suitable adhesive using the well known bonding technique, the cured adhesive is apt to irritate the wearer's skin. Attaching by suture is disadvantageous in a slow speed for working and relatively expensive. Although use of supersonic welding technique has already been suggested, no specific method has been devised for use in the continuous process manufacturing of the garment.

Accordingly, it is a principal object of this invention

to eliminate the disadvantages of the above-mentioned prior art by using a supersonic welder including a drum provided with anvil means on the basis of findings that supersonic welding can minimize irritation to the wearer's skin and facilitate a desired intermittent attaching to be obtained.

The object set forth above is achieved, according to this invention, by an attaching method used in a continuous manufacturing process for the pants-type garment, said method comprising steps of laying front and rear bodies of said garment comprising at least a water-permeable topsheet and a water-impermeable backsheets, one on another and then forming attaching lines along the laterally opposite waist sides of said garment, and an apparatus used to perform this method.

This method for attaching is characterized in that both said topsheet and backsheets contain thermally weldable material; a supersonic welder used to perform said attaching includes a horn having a length substantially equal to that of each attaching line to be formed along each of the laterally opposite waist sides and anvil means; said horn is provided transversely of a direction in which said top- and backsheets are fed; said anvil means are opposed to said horn and provided on a peripheral surface of a drum rotatable in the same direction as that in which said top- and backsheets are fed; said anvil means comprise a

plurality of projections intermittently arranged so as to correspond to a given attaching pattern; and said front and rear bodies laid one on another are continuously fed to said supersonic welder. In a preferred embodiment, the garment includes elastic members attached around a waist-opening and/or leg-openings.

The apparatus comprising a supersonic welder used to perform said attaching is characterized in that a horn of the supersonic welder has a substantially same length as that of each attaching line to be formed along each of the laterally opposite waist sides and is provided transversely of the direction in which said top- and backsheets are fed; and anvil means are opposed to said horn and provided on a peripheral surface of a drum rotatable in the same direction as that in which said top- and backsheets are fed and comprise a plurality of projections intermittently arranged so as to correspond to a given attaching pattern. In one of preferred embodiments, at least a pair of anvils are provided symmetrically and at a given angle with respect to an axis of the drum. In the other preferred embodiment, a clearance between adjacent projections in a predetermined area of each anvil is larger than a width of each said elastic member to be laid in such a clearance.

Both the water-permeable topsheet and the water-impermeable backsheet contain thermally weldable material,

and the front and rear bodies comprising these top- and backsheets laid one on another may be continuously fed to the supersonic welder to obtain the desired attaching lines in continuous manner, each of the attaching lines having an intermittent attaching pattern and presenting a non-irritating touch.

When it is desired to provide the garment with the elastic members around the waist-opening and/or the leg-openings, said elastic members are positioned between the associated pairs of adjacent projections on the drum, ensuring that only the top- and backsheets are squeezed between the horn and the anvil means.

There are provided on the peripheral surface of the rotatable drum a pair of anvils in a symmetric relation with respect to the axis of the drum and it is thereby facilitated to form, with respect to each pair of adjacent individual garments in the continuous manufacturing process, a pair of closely adjacent attaching lines along the waist sides adjacent each other of these adjacent individual garments.

The horn is provided in parallel with the axis of the drum while the anvil is provided at an angle with respect to said axis so that an area over which the horn presses crosswise against the anvil may be relatively reduced and thereby a load on the horn required for proper welding may

be correspondingly reduced.

The invention will be described in more detail by way of example with reference to the accompanying drawings, in which:

Fig. 1 is a perspective view of an individual garment of pants-type;

Fig. 2 is an exploded view of this garment;

Fig. 3 is a schematic plan view partially illustrating a continuous process for manufacturing the garments;

Fig. 4 is a side view of a supersonic welder;

Fig. 5 is a plan view of anvil means;

Figs. 6A, 6B and 6C are side views of the anvil means; and

Figs. 7A and 7B are perspective views illustrating, by way of example attaching lines formed along laterally opposite sides of a waist.

Figs. 1 and 2 are a perspective view of a pants-type garment 1 manufactured by the method of this invention and an exploded perspective view of the garment 1 illustrating an arrangement of components in the direction of thickness, respectively.

The garment 1 comprises a water-permeable topsheet 2, a

water-impermeable backsheet 3, and an absorbent core 4 sandwiched between these sheets. These sheets are folded together along a crotch line 13, with the topsheet 2 facing inward, so as to define a front body 10 and a rear body 11. The garment 1 has a waist-opening 7 and a pair of leg-openings 8. A ribbon-like elastic member 5 intermittently bonded in its stretched state to an inner surface of the backsheet 3 around said waist-opening 7 and similarly ribbon-like elastic members 6 are provided around respective said leg-openings 8. The absorbent core 4 is intermittently bonded to the backsheet 3 which is, in turn, intermittently bonded to the topsheet 2 over areas in which both sheets 2, 3 are in contact with each other.

Fig. 3 schematically illustrates a part of the continuous process for manufacturing the garment 1, along which a continuous member 31 folded in two destined to become the front body 10 and the rear body 11 is formed with the attaching lines 14 and the leg-openings 8. In the illustrated process the continuous member 31 has been folded in two along a longitudinal line 13A with the topsheet 2 facing inward and the backsheet 3 facing outward. The line 13A corresponds to the crotch line 13 of the garment 1. The absorbent core 4 to be sandwiched between the top- and backsheets 2, 3 is not shown. Onto the inner surface of the backsheet 3, an elastic member 6A is intermittently bonded

in its stretched state so as to describe a semicircle-like curve defined by a diameter extending along the line 13A and a rectilinear elastic member 5A is intermittently bonded, also its stretched state, along a side edge extending in parallel with said line 13A. The member 31 is illustrated as broken away in step (I). In step (II), the member 31 is provided with a pair of attaching lines 14 symmetrically with respect to a line L dividing the semicircle described by the elastic member 6A. In step (III), a piece 32 defined slightly inside the semicircle described by the elastic member 6A is cut off from the member 31 to form a cut corresponding to each pair of adjacent leg-openings 8. In step (IV), the member 31 is provided with cuts each extending across the member 31 between each pair of adjacent attaching lines 14 to separate an individual garment 1. Finally in step (V), the individual garment 1 is obtained. While the respective steps (I) through (V) are illustrated to be continuous, these steps may be appropriately spaced one from another. It is also possible to provide separate continuous members destined to become the front and rear bodies 10, 11, respectively, which are separately fed, then laid one on another, and attached to each other along the area corresponding to the line 13A.

Referring to Figs. 4 through 6, a supersonic welder 40 used to provide a pair of attaching lines 14 will be

described. Fig. 4 is a side view thereof. The welder 40 comprises a supersonic wave generator 41, a horn 42 directly connected to the generator 41, a rotatable drum 43 opposed to said horn 42, and respective pairs of anvils 44, 44' provided on the peripheral surface of the drum 43. The generator 41 is supported by a height-adjustable pressurizing arm 45. The welder 40 further comprises pairs of guide rolls 46, 47 adapted to guide the continuous member 31 between the horn 42 and the anvil 44 or 44'. Supersonic wave generating condition as well as pressurizing condition of the arm 45 may be appropriately selected to provide the continuous member 31 with non-irritating touch of welded area.

Figs. 5, 6A, 6B and 6C are plan and side views, respectively, of the anvil 44. Referring to Fig. 5, the pair of anvils 44 are provided on the peripheral surface of the rotatable drum 43 symmetrically but respectively at a small angle with respect to an axis 50 of said drum 43. The other pair of anvil 44' are similar to the pair of anvils 44. In this manner, the number of anvil pairs can be appropriately selected depending on the size of the drum 43. On the other hand, the horn 42 is provided in parallel to the axis 50 and therefore crosses the anvils 44 so that an area over which these horn 42 and the anvils 44 press crosswise against each other with interposition of the

continuous member 31 is substantially reduced with respect to the case in which the horn and the anvils are arranged in parallel to each other. Consequently, a load on the horn 42 required for proper welding is reduced in a relative meaning and the supersonic wave generator 41 used can be also of a smaller size. This advantageously reduces a manufacturing cost for the apparatus 40. The anvils 44 in each pair can be arranged closely adjacent to each other so that a useless portion of the continuous member 31 which is necessarily present between each pair of adjacent garments 1 may be minimized.

Figs. 6A, 6B and 6C are enlarged side views of the anvil 44. Figs. 6A, 6B and 6C correspond to sections (A), (B) and (C) in Fig. 5, respectively. Each anvil 44 of the figures comprises a plurality of projections 51A, 51B, 51C separated one from another by grooves 52A, 52B, 52C of given depths and arrangement of said projections as well as said grooves depending on the desired attaching pattern. While it is generally important for said grooves to be relatively shallow so as to avoid an excessive slack of the continuous member 31, the grooves 52A, 52C are shown to be deeper than the groove 52B so that the elastic members, for example the member 5, may be completely received therein.

Also referring to Figs. 6A, 6B, and 6C, the horn 42 and the anvil 44 squeeze the continuous member 31 therebetween

to perform the desired welding. No welding occurs at areas defined by said grooves 52A, 52B, 52C and, therefore, the continuous member 31 thus folded in two and welded together is provided with gaps 53. These gaps 53 function as vents provided between the front body 10 and the rear body 11 and through which the interior and the exterior of the garment 1 communicate with each other. The elastic members 5, 6 can be completely received in said grooves and free from the squeezing effect and therefore the continuous member 31 can be squeezed to a uniform thickness and welded together under a stable condition. The anvils 44 may be appropriately heated by an associated heater, which is not shown, to reduce a time required for welding.

Figs. 7A and 7B are partial perspective views of the garment 1, showing details of the attaching lines 14. The attaching line 14 shown by Fig. 7A comprises a plurality of intermittently and parallelly arranged substantially rectangular welded zones 14A. However, orientation of these welded zones 14A is somewhat different between the areas adjacent the waist-opening 7 and the leg-openings 8, respectively. More specifically, some welded zones 14A are arranged in parallel with the elastic member 5 in the area adjacent the waist-opening 7 and some welded zones 14A are arranged in parallel with the substantially semicircular elastic member 6 in the area adjacent the

respective leg-openings 8. Obviously, the respective elastic members 5, 6 occupy non-welded zones defined by adjacent welded zones 14A. The attaching line shown by Fig. 7B comprises a plurality of scattered substantially circular welded zones 14A and the respective elastic members 5, 6 are positioned in spaces defined among these welded zones 14A.

In the garment 1, both the topsheet 2 and the backsheet 3 contain thermally weldable material which may be, for example, thermoplastic synthetic fibre, woven or nonwoven fabric thereof, thermoplastic film, and elastomer film. Among them, nonwoven fabric comprising heat crimped composite fibre is particularly preferable with respect to feeling and stretchability. These woven fabric, nonwoven fabric and film may be employed independently or in combination. For example, stretchable film may be attached onto stretchable nonwoven fabric with said nonwoven fabric facing outward to be used as the backsheet. The elastic members 5, 6 may be made of natural or synthetic rubber. The absorbent core 4 may be made of crushed pulp mixed with high water absorptive polymer powder and then molded into a desired shape.

The front and rear bodies each comprising the top-and backsheets both containing thermally weldable material are laid one on another, then continuously fed to the supersonic welder having the anvils each comprising a plurality of

intermittently arranged projections and thereby the garments are continuously provided along the laterally opposite waist sides with the attaching lines each of an intermittent pattern.

The top- and backsheets are welded one to another with the elastic member(s) attached around the waist-opening and/or the leg-openings being positioned in the grooves of the respective anvils so that said elastic members may not interfere with welding. In this way, the welding is achieved in a stabilized condition and thereby it is facilitated to obtain the attaching lines of agreeable appearance and non-irritating touch.

The arrangement such that the horn is provided in parallel to the drum axis while the anvils are provided at a given angle with respect to said axis advantageously reduces the area over which the horn and the anvils press against one another and thereby correspondingly reduces a load on the horn.

The anvils may be heated to reduce the time required for the desired welding.

CLAIMS

1. Attaching method used in a continuous manufacturing process for pants-type garment including the steps of laying front and rear bodies of said garment, each comprising at least a water-permeable topsheet and a water-impermeable backsheet, one on another and then forming attaching lines along laterally opposite waist sides of said garment wherein:-

both said top- and backsheets contain thermally weldable material;

a supersonic welder used to perform said attaching includes a horn and anvil means both of which have lengths substantially corresponding to that of each attaching line to be formed along each of the laterally opposite waist sides;

said horn is provided transversely of a direction in which said top- and backsheets are fed;

said anvil means are opposed to said horn and provided on a peripheral surface of a drum rotatable in the same direction as that in which said top- and backsheets are fed;

said anvil means comprise a plurality of projections intermittently arranged so as to correspond to a given attaching pattern; and

said front and rear bodies laid one on another are

continuously fed to said supersonic welder between said horn and said anvil means so that the attaching lines of said attaching pattern are continuously formed along the laterally opposite waist sides.

2. Attaching method as claimed in Claim 1, wherein said garment includes elastic member(s) attached around a waist-opening and/or leg-openings and said elastic member(s) is(are) received between said projections during supersonic welding.

3. Supersonic welder used in a continuous manufacturing process for pants-type garment including the steps of laying front and rear bodies of said garment each comprising at least a water-permeable topsheet and a water-impermeable backsheet, one on another and then forming attaching lines along laterally opposite waist sides of said garment, said supersonic welder including:-

a horn having a length substantially corresponding to that of each attaching line to be formed along each of the laterally opposite waist sides and being provided transversely of the direction in which said top- and backsheets are fed; and

anvil means opposed to said horn and provided on a peripheral surface of a drum rotatable in the same direction as that in which said top- and backsheets are fed and

comprising a plurality of projections intermittently arranged so as to correspond to a given attaching pattern.

4. Supersonic welder as claimed in Claim 3, wherein said horn is provided in parallel with an axis of said drum while said anvil means are pairly provided on said drum symmetrically and at a given angle with respect to said drum axis.

5. Supersonic welder as claimed in Claim 3 or 4, wherein a clearance between adjacent projections in a predetermined area of each anvil is larger than a width of each of said elastic members to be attached around said waist-opening and/or leg-openings.

6. Supersonic welder as claimed in Claim 3,4 or 5, wherein there is provided a heater in association with said anvil means.

7. Method for attaching components of pants-type garments substantially as herein described with reference to the accompanying drawings.

8. Apparatus for attaching components of pants-type garments substantially as herein described with reference to the accompanying drawings.

Patents Act 1977
Examiner's report to the Comptroller under
Section 17 (The Search Report)

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Relevant Technical fields

(i) UK CI (Edition K) B5K

(ii) Int CI (Edition 5) B29C 65/02, 65/08

Search Examiner

MIKE HENDERSON

Databases (see over)

(i) UK Patent Office

(ii)

Date of Search

23 SEPTEMBER 1991

Documents considered relevant following a search in respect of claims 1-8

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
	NONE	

SF2(p)

sw - doc99\fil000563

Category	Identity of document and relevant passages	Relevance to claim(s)

Categories of documents

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